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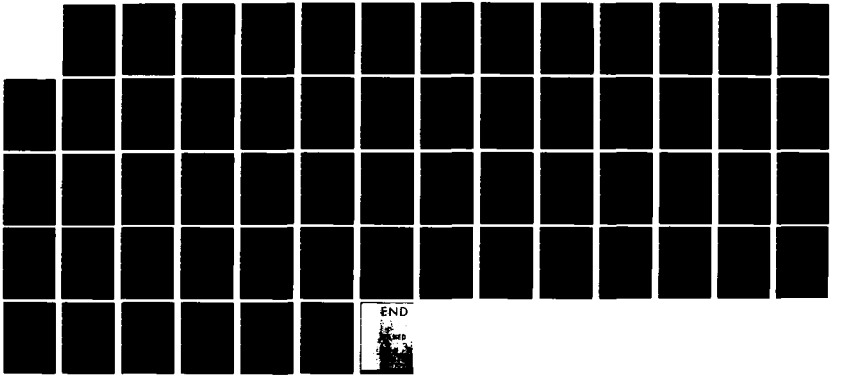

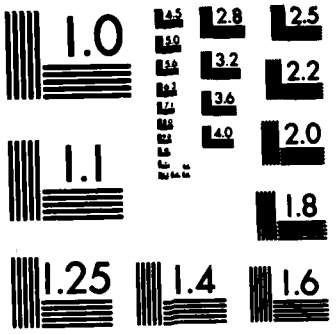

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ENHANCEMENT OF TOLERANCE FOR PAIN: GROUP VERSUS INDIVIDUAL STRESS INOCULATION TRAINING

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This study evaluated three specific areas of stress inoculation training in the enhancement of tolerance for pain: (1) maintenance of treatment effects at two-week follow-up testing; (2) group versus individual administration of the treatment package; and (3) the use of role rehearsal in aiding consolidation of information in the application phase of the treatment. The results show a significant increase in pain tolerance on posttest measurement. Neither group nor individual administration of the treatment package was shown to be more effective in enhancing tolerance for pain. However, some practical reasons for preferring group administration were discovered.

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Enhancement of Tolerance for Pain:

Group versus Individual Stress

Inoculation Training

Running head: Enhancement of Tolerance for Pain

Abstract

This study evaluated three specific areas of stress inoculation training in the enhancement of tolerance for pain: (1) maintenance of treatment effects at two-week follow-up testing; (2) group versus individual administration of the treatment package; and (3) the use of role-rehearsal in aiding consolidation of information in the application phase of the treatment. The results show a significant increase in pain tolerance on posttest measurement. There were no decay effects on two of the outcome measures on follow-up and an actual improvement on the most important measure, total pain tolerance time. Neither group nor individual administration of the treatment package was shown to be more effective in enhancing tolerance for pain. However, some practical reasons for preferring group administration were discovered. The use of role-rehearsal in which the subject assumed the role of the instructor in teaching the technique to a "novice subject" was not found to have a significant effect on outcome measures. The results suggest some interesting extensions of the efficacy of the stress inoculation treatment paradigm, while also indicating areas that will require future studies to help further delineate the parameters of this cognitive technique.

Enhancement of Tolerance for Pain: Group versus Individual Stress Inoculation Training

There have been numerous compelling arguments offered in recent reviews of the pain literature suggesting that pain is not simply a function of the amount of tissue damage. Nor can it be understood adequately by specifying parameters of physical stimuli as suggested by sensory-physiological theories. It has been argued that pain should be seen as a subjective experience, with the amount and quality of the pain determined by several factors: previous experiences, how they are recalled, ability to understand the cause and the consequence of the pain, plus the actual sensory input (Clark & Hunt, 1971; Hackett, 1978; Liebeskind & Paul, 1977; Turk, 1978; Tursky, 1976).

The concept of cognitive enhancement of tolerance for pain is certainly not new. As long ago as the stoic philosophers, it was believed that man could overcome pain by force of reason, the "rational repudiation" of pain. The writings of Descartes and Spinoza also recommended that pain should be overcome through "permeation" of reason (Turk, 1978). Of the cognitive techniques that have been employed in the management of pain, perhaps the oldest is that of distraction or attention-diversion as exemplified by Kant's (cited in Fulop-Miller, 1938) usage of the name "Cicero" to distract him from the pain caused by his gout. In more recent years, a number of other

cognitive and behavioral methods have been employed to enhance pain tolerance, including: (1) somatization (e.g., Bobey & Davidson, 1970; Evans & Paul, 1970); (2) imaginative transformation of pain (e.g., Blitz & Dinnerstein, 1968, 1971; Knox, 1972); (3) imaginative transformation of context (e.g., Blitz & Dinnerstein, 1968; Knox, 1972); and (4) relaxation and deep breathing (e.g., Bobey & Davidson, 1970; Mulcahy & Janz, 1973; Neufeld & Davidson, 1971). The design typically employed in these studies is one in which only one of the strategies cited above is used in the experimental group while a second group employs a different strategy or functions as a control.

Several authors (e.g., Meichenbaum, 1975; Melzack & Casey, 1970; Turk, 1978) have suggested that although a wide variety of general procedures are capable of reducing pain, a more effective means of modifying an individual's perception of a stressful situation would be to "tailor" a procedure to meet the needs of the particular individual in the specific situation. This multifactor approach and individualization of treatment have been incorporated in experimentation with stress inoculation for pain (e.g., Hackett, 1978; Hackett & Horan, 1980; Horan, Hackett, Buchanan, Stone, & Demchik-Stone, 1977; Meichenbaum & Turk, 1976; Turk, 1975, 1977). Since its original application (Turk, 1975) stress inoculation training for pain has been replicated and extended to include generalization to novel, cold pressor stress (Turk, 1977), and the significance of the combined stress inoculation treatment versus that of the various components (Hackett, 1978; Horan, et al., 1977). The suggestion has been made

(Turk, 1978) that attempts to generalize stress inoculation training to other populations and settings should be made in order to determine the parameters of its usage.

The purpose of the study conducted was to help further elucidate those parameters. Two specific areas and their interaction were studied: (1) does the addition of role-rehearsal in the application phase of the procedure add to the effectiveness of the treatment?; and (2) is small group administration as effective as individual administration? The first question is an outgrowth of a question raised in Jaremko's (1979) review of the stress inoculation training package. The second question was raised as an attempt to see if small group application as used by Novaco (1977) with anger control could also be applied in the control of pain. A third question that was addressed by a two-week follow-up in the study was the efficacy of the technique over time, an area that has been largely ignored in the literature.

Method

Subjects

Forty-eight female subjects volunteered for the experiment as one means of gaining extra credit in a home-nursing course for non-nursing majors at a large private university. Thirty of the students were in upper division standing in their majors which covered 22 separate fields as diverse as chemistry, fashion merchandizing, and history. The age of the women ranged from 18 to 29 with a mean of

20.6. The most common pain related complaint among the sample was menstrual cramps (n = 21), with headaches and backaches being mentioned as problems by fewer than 10%. Four of the subjects were pregnant, but were informed that the experiment would not endanger their pregnancy in any way. The subjects were randomly assigned to one of four experimental groups (Cells I through IV). All subjects completed all portions of the experiment.

Apparatus

Testing of pain tolerance was conducted in a room in which the subject was seated in a recliner with a female technician seated adjacent to the subject's dominant arm. The technician monitored a hand dynamometer, a sphygmomanometer (blood pressure cuff), and recorded relevant times as measured by a stopwatch.

Experimental Design

Three trials of the blood pressure cuff test were given. The first (pretest) served to establish a baseline. The second trial (posttest) was a test for treatment effects. The third trial (follow-up) served as a measure of the treatment effects over time. The four experimental conditions were: Cell I which received individual stress inoculation and was instructed to use both mental rehearsal and role-rehearsal; Cell II which received individual stress inoculation and was instructed in the use of only mental rehearsal; Cell III which received stress inoculation training in a small group application and was instructed to use both mental rehearsal and role-rehearsal; and Cell IV which received stress inoculation training

in a small group application and was instructed in the use of only mental rehearsal.

Procedure

All subjects received the three separate trials on the blood pressure cuff individually with no one other than the female technician present. Two groups (Cells I and II) also received the stress inoculation training as individuals, whereas the two other groups (Cells III and IV) received the stress inoculation training in small groups (n=6). The stress inoculation training procedure was comprised of three phases: an educational phase, a skills acquisition phase, and an application phase.

Subjects in all groups received a pretest using a submaximum effort tourniquet technique (Smith, Egbert, Markowitz, Mosteller, & Beecher, 1966) which produces a dull, aching, slowly mounting pain that closely approximates pathological pain. This technique has been found to mimic the duration and severity of somatogenic pain producing the marked autonomic changes that frequently accompany pain of pathological origin (Sternbach, 1974) and has been suggested as the best laboratory analogue to the pain encountered in clinical settings (Clark & Hunt, 1971; Hackett, 1978). The procedure involves the inflation of a blood pressure cuff at a high level (240 mm Hg) followed by a moderate amount of exercise by the arm (squeezing a hand dynamometer). All four treatment groups then received the first two phases of the stress inoculation training via a video tape-recorded presentation by the trainer. In the first phase (educational) a

rationale for the individual's response to the pain stimulation was presented based on Beecher's (1959) and Melzack and Wall's (1965) theories of pain. It was explained that the experience of pain is composed of two interactive components: the sensory input, and the individual's reactions to the sensations. Following the education phase, the trainer proceeded to describe the various techniques that the subject could employ to handle each component of the pain experience (skills acquisition phase).

First, the subjects were informed that they could control the sensory input component of pain by such means as physical and mental relaxation and by attending to slow, deep breathing. Next, subjects were informed that their reactions to the sensation could be controlled by a variety of techniques which fall under two main categories: (a) attention-diverting coping strategies; and (b) self-instructional training, both of which help to deal with the feelings of helplessness and absence of control that frequently accompany experience of an aversive stimulus. The suggestion was made that those feelings can be "short-circuited" by the use of several of the cognitive coping strategies. The attention-diverting coping strategies presented included: attention diversion; somatization; and imagery manipulation--imaginative inattention, imaginative transformation of pain, and imaginative transformation of context. The self-instructional training included: statements preparing the individual for the intense stimulation before it becomes too strong; statements confronting and handling the intense stimulation;

statements that cope with thoughts and feelings that arise at critical moments; and self-reflection and positive self-statements. The subjects were encouraged to select from those strategies in a "cafeteria style." Subjects were also encouraged to develop a "plan" to deal with the pain and especially to employ such coping techniques at "critical moments" when the pain seemed most unbearable. This concluded the first two phases of the training and then the trainer presented the third phase, the application phase, in person.

The application phase was conducted by the use of two different behavioral techniques. Subjects in Cell I, which received individual stress inoculation, were instructed to use mental rehearsal and role-rehearsal, while subjects in Cell II (the other individual administration group) were instructed in the use of only mental rehearsal. The subjects in Cell III, who received stress inoculation training in a small group application, were instructed in the use of both behavioral techniques (mental rehearsal and role-rehearsal), while the subjects in Cell IV (the other small group application) only received mental rehearsal training. The subjects who received instruction in mental rehearsal (all cells) were asked to imagine themselves in stressful situations, including the blood pressure cuff situation they had experienced during the pretraining trial. Mental rehearsal can be viewed as the subject providing herself with a model of how she should behave in a stressful situation, referred to as muted role-taking by Sarbin (1972). The subjects instructed in role-rehearsal (Cells I and III) were asked to rehearse giving advice

to a novice subject on how to cope with stress, specifically with the experience of pain. The instructor assumed the role of novice subject while the subject played the role of trainer in the individual administration (Cell I). The subjects were asked to write down on a piece of paper how they would instruct a novice subject in the group administration (Cell III). The subject, in this way, "hand tailors" the content of her role in such a manner as to account for the unique motives and predispositions of one particular person, namely herself (Turk, 1975).

The subject, prepared with a one-hour skills training package (based on Turk's manual, 1980) then underwent a posttraining trial on the blood pressure cuff given within an hour of completion of the training. The subjects were also tested two weeks after completion of the skills training as a follow-up of the effectiveness of training.

Three outcome measures were employed: time until the initial recognition of pain; total tolerance time (total amount of time from the initial inflation of the cuff until removal of the cuff); and subject self-report rating on the Subjective Discomfort Scale (score 0 to 10C; Stone, 1977). The first two ratings were completed by one of four female technicians randomly assigned to the rating task. The technicians were unaware of the purpose for which the rating would be used.

Results

The three measures obtained from the blood pressure cuff task were used to evaluate the efficacy of the stress inoculation treatment groups. There were no subject data lost due to attrition in any of

the treatment cells because all initial 48 of the subjects completed all segments of the experiment. Table 1 presents the means and standard deviations of residual gain scores produced by each treatment condition on each dependent measure. (A gain is residualized by expressing the posttest score as a deviation from the posttest-on-pretest regression line [cf. Cronbach & Furby, 1970; Dubois, 1957]). In this experiment, three separate residual gain scores were analyzed for each dependent measure: posttest minus pretest, follow-up minus pretest, and follow-up minus posttest. In addition, an analysis of overall effectiveness of combined treatment was conducted by pooling the results of the four cells and significant differences were found between pretest and posttest scores on all measures (subjective $F\ (1,44) = 10.34$, $p<.01$; report of pain $F(1,44) = 5.99$, $p<.01$; total tolerance $F(1,44) = 27.80$, $p<.01$). Significant general effects for all treatment conditions were also found between pretest and follow-up scores on all measures (subjective $F(1,44) = 12.72$, $p<.01$; report of pain $F(1,44) = 8.27$, $p<.01$; total tolerance $F(1,44) = 59.37$, $p<.01$).

The principle interest of the study was an evaluation of the effects of group administration and role-rehearsal in the application phase. In order to accomplish this evaluation, 2 x 2 (presence or absence of individual administration by presence or absence of role-rehearsal in the application phase) analyses of variance were conducted on each dependent variable with a "regression using many models and general estimation II" computer program (Scott, Carter, &

Bryce, 1980). These were conducted for the three classifications of residual gain scores (posttest minus pretest, follow-up minus pretest, and follow-up minus posttest) in an attempt to determine the effects of the treatment conditions over time.

Posttest: Residual Gains

No significant main effects emerged for individual administration (subjective $F(1,44) = 0.27$, $p>.10$; report of pain $F(1,44) = 3.29$, $p<.08$; total tolerance $F(1,44) = 1.03$, $p>.10$). Nor did any significant main effects appear for role-rehearsal (subjective $F(1,44) = 0.454$, $p>.10$; report of pain $F(1,44) = 1.50$, $p>.10$; total tolerance $F(1,44) = 0.15$, $p>.10$). There also were no significant interactions (subjective $F(1,44) = 0.14$, $p>.10$; report of pain $F(1,44) = 0.99$, $p>.10$; total tolerance $F(1,44) = 0.02$, $p>.10$). Essentially, then, on the posttest evaluations of the treatment conditions, no statistically significant differences were found.

Follow-up: Residual Gains

There were no significant main effects evident for individual administration (subjective $F(1,44) = 1.25$, $p>.10$; report of pain $F(1,44) = 0.53$, $p>.10$; total tolerance $F(1,44) = 0.35$, $p.>10$). Role-rehearsal did not significantly change the results either (subjective $F(1,44) = 2.85$, $p<.10$, report of pain $F(1,44) = 0.09$, $p>.10$; total tolerance $F(1,44) = 0.001$, $p>.10$). There were no significant interaction effects (subjective $F(1,44) = 0.05$, $p>.10$; report of pain $F(1,44) = 0.20$, $p>.10$; total tolerance $F(1,44) = 0.22$, $p>.10$). Again,

on follow-up, no significant differences were evident between treatment conditions.

Follow-up versus Posttest: Residual Gains

When the two previous categories of residual gain are compared with each other, no significant main effects are evident. For individual administration, no significant gains on any of the three measures were found, (subjective $F(1,44) = 0.98$, $p>.10$; report of pain $F(1,44) = 1.29$, $p>.10$; total tolerance $F(1,44) = 2.99$, $p<.10$). Nor were any significant main effects seen for role-rehearsal (subjective $F(1,44) = 2.80$, $p>.10$; report of pain $F(1,44) = 2.68$, $p>.10$; total tolerance $F(1,44) = 0.15$, $p>.10$). Also, no significant interaction main effects were evident (subjective $F(1,44) = 0.88$, $p>.10$; report of pain $F(1,44) = 0.33$, $p>.10$; total tolerance $F(1,44) = 0.12$, $p>.10$).

The final analysis computed considered overall effect of the combined treatment packages using follow-up minus posttest residual gains as a measurement. This aspect was analyzed in an attempt to determine the efficacy of stress inoculation training over a two-week period without any intervening instruction to practice the pain control technique. Significant effects were seen on one of the three dependent measures (subjective $F(1,44) = 0.53$, $p>.10$; report of pain $F(1,44) = 0.29$, $p>.10$; total tolerance $F(1,44) = 7.15$, $p<.02$). It can be seen that stress inoculation training's therapeutic utility can be maintained over a period of time with little or no practice; indeed,

the significant increase of the total tolerance of pain is indicative of further enhancement of pain tolerance.

Discussion

The overall findings of this study provide several lines of support for the efficacy of the stress inoculation paradigm for the enhancement of tolerance for pain. The four treatment groups, viewed as a whole, showed significant main effects on all three dependent measures between the pretest and posttest comparisons. This is consistent with past research findings (Hackett, 1978; Horan et al., 1977; & Turk, 1977), which found that subjects receiving stress inoculation training did significantly better than no treatment or placebo controls. Further, on follow-up testing, a significant enhancement of total pain tolerance was shown, while the other two outcome measures showed insignificant change. This enhancement of total pain tolerance (ability of the individual to endure painful stimuli) was totally unexpected. It had been assumed that like many other training tasks, there would be a decline in overall performance over time. Instead, we find no decay effects on two measures and an actual improvement on the most important of the three dependent measures.

It might be argued that this increased pain tolerance may be a product of maturation rather than treatment effects; this is probably not the case, maturation effects (while not having been fully tested) have not been noted in past studies that used a no treatment or placebo treatment control (Hackett, 1978; Horan et al., 1977; Turk,

1977). Furthermore, treatment effects were maintained even though a majority of subjects reported spending less than 15 minutes thinking about or practicing the techniques during the two-week period between posttest and follow-up testing.

The increased efficacy of individual administration of stress inoculation over small group administration was not supported by the data. There was, however, some qualitative evidence that tended to argue for small group administration as the preferred mode of administration. In settings where resources are scarce, group administration would be a more cost effective method to administer the treatment package because it would mean that the training staff could "inoculate" many more people using fewer resources. Interesting anecdotal reports suggest that participants preferred the group administration. Several subjects reported that they felt better about the treatment and its potential effectiveness because it was in a group and they knew that others were going through the same experience. This "knowing", however, could not be shown to have a statistically significant effect on any of the outcome measures. With such subjective preferences arguing for small group administration, it is important for further research to be conducted in an attempt to base the choice of administrative mode upon empirical information. One suggestion for such research is to increase the overall sample size by increasing the number of small groups receiving the treatment so that more variance in administration can be accounted for. This would help to control for the problems suggested by the observation that members of a group tend to respond similarly (Hendrix, 1981).

Although role-rehearsal has traditionally been included in the stress inocculation training package, its usefulness had not been tested previously. It was expected that its inclusion would aid in the consolidation of information in the application phase, thereby enhancing pain tolerance. However, no significant differences were found between those subjects who used both mental rehearsal and role-rehearsal and those who used only mental rehearsal. It is suggested that without further empirical evidence arguing for the inclusion of role-rehearsal, its use in the treatment package be questioned.

An important aspect of the outcome measurement in this study was the use of residual gain scores which enabled the measurement of improvement (or lack thereof) in individual pain responses as compared to one's own previous performance. In a very real sense, the person acted as her own control so that the deviation from a mean response is little more than ancillary information. This is as it should be in research that deals with a topic that is as subjective an experience as pain. Residual gain scores were computed on each of the dependent measures: total tolerance time, time until initial recognition of pain, and subject self-report rating.

Total tolerance time was viewed as the most important dependent variable and can be seen as the final willingness of the individual to endure the pain stimulus. It was recorded by the technician and was easily verifiable. The report of onset of pain can be viewed as an individual's becoming cognizant of the subjective

experience of pain, "Ah ha, this hurts." Time until initial report of pain, while also recorded by the technician and an important aspect of pain perception and control was not as reliable to calculate. This was due to reliance on the subject's remembering to report the onset of pain. Several subjects gave the report as: "Oh, I started feeling pain about a half a minute ago and forgot to tell you." This could have been overcome by the technician asking repeatedly if pain had been felt although this procedure might inject undesirable demand characteristics. The third measure, subject self-report rating, was reported on a continuum of 0 to 100 on the Subjective Discomfort Scale (Stone, 1977) by the subject immediately after each trial. It is representative of how the person viewed the maximum discomfort experienced in the trial on an overall scale; or "how would I rate the degree of pain compared to what I could have stood before it would have become unbearable." Like total tolerance time, subject self-report ratings presented no difficulties for data collection.

While these three outcome measures are often used in pain research (e.g., Hackett, 1978; Horan et al., 1977; Stone, 1977), there has been no discussion in the literature about problems with these measurements or their clinical pain measures. We have suggested that because total pain tolerance and subject self-report rating present fewer measurement problems than does initial pain response time, they can be employed with greater confidence. No research has been undertaken that attempts to further understanding of the issues related to clinical pain correlates. It can be argued that initial report of

pain is related to what is meant when an individual speaks of having a low or high "pain tolerance", however, its relevance can be questioned. The other two measures can be much more clearly correlated to actual pain experiences: total tolerance time is related to the time until the clinical pain patient chooses to "take a pill" to terminate the pain, while subject self-report rating is related to how the person views her pain experience. It is argued that while subject self-report rating is important, in actual pain patients, it is the total time tolerated that is the best outcome measure because it is indicative of overall ability of the individual to cope with the adversive stimulation (i.e., pain). It will be interesting to see if this argument holds true in future measurement of pain correlates in clinical populations.

The stress inoculation procedure is a coping skills approach that trains subjects in a variety of techniques which can be employed differentially across situations and across individuals. The term "inoculation" is a medical metaphor. The therapeutic process works by exposing the client to manageable doses of a stressor (e.g., pain) that arouse, but do not overwhelm, her defenses (Turk, 1978). One of the most appealing aspects of the training program is its allowance for individual tailoring of the package. Subjects were encouraged to develop their "own plan" of how to deal with the pain. There were several very novel ways developed to cope with the pain. One woman spent most of the time singing aloud to deal with the pain. She also reported cognitively rehearsing the various dance steps that

accompanied the songs. Another woman esoterically concentrated on the various sensations and changes in hue occuring while her arm was in the blood pressure cuff. Yet another woman spent the time cognitively rehearsing the steps necessary to pack her parachute and board a light plane for an afternoon of sport parachuting.

It has been convincingly argued that it is because stress inoculation training allows for such variety in the individual development of a treatment approach that it has proven more effective than the single treatment strategies, whether medical or psychological, in the enhancement of tolerance for pain (Turk, 1978). In this research the knowledge of the effects of stress inoculation has been extended so that it has been shown to be an effective treatment method over a two-week period with little or no practice. Indeed on the most important dependent measure--total tolerance time--there was a significant increase in total tolerance at follow-up. Neither group nor individual administration was shown to be more effective in enhancing tolerance for pain. This suggests that until further research argues for the adoption of one mode of administration, either method could be used; the decision being made on the basis of such factors as setting, therapist availability, and indications for treatment.

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Table 1

Residual Gain Means and Standard Deviations for Pain Tolerance Treatment Groups

Dependent Measure		TREATMENT											
		CELL I			CELL II			CELL III			CELL IV		
		PST/PRE	FU/PRE	FU/PST	PST/PRE	FU/PRE	FU/PST	PST/PRE	FU/PRE	FU/PST	PST/PRE	FU/PRE	FU/PST
Subject Self-report Rating*	$\bar{X}$	9.2	10.0	0.8	4.1	2.5	-1.6	10.0	16.8	6.8	8.5	7.1	-1.4
	SD	13.6	9.8	5.5	18.6	16.3	14.1	20.8	27.2	11.9	14.6	12.1	10.5
Initial Recognition of Pain**	$\bar{X}$	176.9	115.3	-61.6	158.7	175.8	17.1	112.3	92.3	-19.9	-62.3	81.1	143.4
	SD	372.7	291.3	275.1	258.0	294.5	213.3	264.1	218.7	213.1	150.4	306.0	308.5
Total Tolerance Time**	$\bar{X}$	388.8	511.7	122.5	327.5	379.9	52.4	256.0	450.3	194.3	229.3	501.1	271.8
	SD	339.7	291.9	265.8	465.1	440.2	220.7	442.8	317.9	360.3	308.9	401.4	448.4

* Expressed on a Scale of 0 to 100
** Expressed in seconds

PST/PRE: Posttest minus pretest
FU/PRE: Follow-up minus pretest
FU/PST: Follow-up minus posttest

APPENDIX A

Review of the Literature

This investigation deals with the examination of a comprehensive cognitive-behavioral approach to the management of pain. Any review of the procedural literature in this area, however, would have to be prefaced with a recording of the major aspects of existing theories. Therefore, before proceeding to a more complete discussion of the literature relevant to stress inoculation training, the evolution of the modern theories of pain reception and transmission will be presented. Next, treatment approaches that could roughly be classified as "cognitive-behavioral" will be reviewed, followed by a summarization of the research on stress inoculation.

Pain Theories

Melzack (1973) described the evolutionary history of pain theories under three relatively discrete classifications: affect theories, specificity theories, and pattern theories. Affect theories had their roots in the Aristotelian era and while they clearly predate the other two classifications, they appear to have fallen out of grace with pain researchers. The affect theorists view pain as an emotion--the opposite of pleasure--rather than a sensation, and therefore, all sensory inputs could contain a dimension of pain. While this theory has been taken to extreme perspectives, Melzack argues that this view has some important ramifications for those who study pain as well as those who suffer its effects. Researchers who speak of such components as the "reaction to pain" (Beecher, 1959; Murray, 1971) give great importance to its affective dimensions. Pain can be viewed

as not simply a perceptive event; it also has a strong negative affective quality which drives us to seek to terminate the pain.

The view of pain perception that has been most widely accepted historically has been known as "specificity theory." Specificity theory, the most classical definition of which was probably provided by Descartes more than three centuries ago, is still prevalent throughout much of the medical literature in spite of more recent and powerful theories (Melzack, 1973). Specificity theories propose that the free nerve endings which pervade the skin are specific "pain receptors" while the more complex receptor organs subserve the other sense modalities: touch, heat, and cold. Each cutaneous pain receptor is assumed to have a sensitive area on the skin above it, and to project to a discrete pain center in the brain. While numerous clinical factors defy explanation in terms of a rigid specificity model, it is clear that these early theorists made important contributions that should be retained in further theoretical formulations of pain.

The pattern theories, again according to Melzack (1973), evolved around the turn of the century seemingly as a reaction against the unverifiable assumptions implicit in specificity theories. The simplest version, peripheral pattern theory, posits that excessive peripheral stimulation generates particular patterns of nerve impulses which evoke pain by summation of the skin sensory input of the dorsal horn cells in the spinal cord. Later, historical evidence demonstrating the high degree of pain receptor fiber specialization led to a more tenable version of this conceptual model known as

central summation theory, in which summation of pain producing stimuli occurs at the level of the brain itself, probably via synchronized firing in thalamocortical neural circuits. The primary evidence for this is the frequent failure of surgical spinothalamic cordotomy (even bilateral cordotomy) in abolishing many chronic pain states (e.g., phantom limb pain).

Melzack (1973), after a comprehensive analysis of existing theories of pain perception and transmission, suggests several refinements for further theorizing.

> Any new theory of pain, it is now apparent, must be able to account for:
>
> 1. The high degree of physiological specialization of fibre units and of pathways in the central nervous system.
>
> 2. The role of temporal and spatial patterning in the transmission of information in the nervous system.
>
> 3. The influence of psychological processes on pain perception and response.
>
> 4. The clinical phenomena of spatial and temporal summation, spread of pain, and persistence of pain after healing (p. 153).

The gate-control theory of Melzack and Wall (1965) has attempted to weave these criteria and the contribution of previous theories into a comprehensive mosaic for facilitating a deeper understanding of pain states. Briefly, the gate-control theory posits that descending influences the brain modulate--the "gatekeeping" function of hypothesized neural mechanisms in the dorsal horns of the spinal cord. These mechanisms, in turn, control the flow of ascending peripheral nerve impulses to the central nervous system. "When the

amount of information that passes through the gate exceeds a critical level, it activates the neural area responsible for pain experience and response" (Melzack, 1973, p. 153).

This theoretical evolution is recounted here because of the utility of the gate-control theory in explaining the potent influence of such psychological factors as past experience, attention, and emotional state on the subjective perception of, and response to, noxious stimulation; such cerebral processes, acting through descending (efferent) pathways, could modify pain perception and response by controlling the spinal gate mechanism in either direction. Thus, while such states as anxiety, expectancy, and depression might open the gate, increasing one's sensation of pain, the possibility exists that cognitive and motivational mechanisms for controlling these states could reduce pain by acting at the earliest levels of sensory transmission. Thus, it appears that a tentative neurological vehicle may exist for exerting psychological management over noxious stimulation.

This investigation deals with a cognitive-behavioral treatment approach designed to influence the cognitive, affective, and behavioral components of the pain experience, i.e., a multidimensional approach. However, before discussing the treatment, it is necessary to examine the cognitive-behavioral techniques designed to mitigate anxiety-based dysfunctions. Turk (1978) suggests three reasons why such a review should be considered. First, anxiety is perhaps the first and most consistently implicated psychological mediator of the pain experience (e.g., Hill, Konnetsky, Flanary, & Wilker, 1952 a,b).

Secondly, many of the cognitive and behavioral techniques employed to reduce anxiety have been examined in relation to their effects on pain perception and tolerance. And, finally, many of these specific techniques have been incorporated into multifactored cognitive behavioral regimens utilized in pain management.

Cognitive Behavioral Treatments

One of the major treatments for anxiety based dysfunctions developed out of Wolpe's (1958) work employing a counter conditioning model and a procedure he labelled "systematic desensitization." Systematic desensitization involves the construction of a graduated hierarchy of anxiety-inducing stimuli, relaxation training, and the gradual pairing of items from the hierarchy with a relaxed state. The adequacy of the counterconditioning model has been challenged by a number of investigators (Davison & Wilson, 1973; Mahoney, 1974; Meichenbaum, 1977). Partially as a function of these criticisms, there has been a shift to a more coping-skills model that takes into consideration cognitive, affective, as well as behavioral domains (Mahoney, 1974; Meichenbaum, 1977). Conceptualizing anxiety-based dysfunctions in this manner parallels the emphasis of Melzack and Wall (1965) on the importance of the interaction of cognitive, affective, and behavioral contributions to the total pain experience. A review of some of the skills-training approaches that have been employed will reveal a number of common features that may be incorporated into multidimensional, cognitive, behavioral approaches designed to enhance tolerance for pain.

The investigations of Goldfried and his colleagues (Goldfried, 1971, 1973; Goldfried, Decenteceo, & Weinberg, 1974; Goldfried & Trier, 1974) illustrate one approach to the training of coping skills. Goldfried (1971) has viewed systematic desensitization as a way of teaching his subjects a broad set of self-relaxation skills that can be employed while imagining a number of scenes from different target hierarchies. Emphasis is placed on four components, namely, describing the therapeutic rationale in terms of skills training, the use of relaxation as a generalized coping strategy, the use of multiple-theme hierarchies, and a training in "relaxing away" scene-induced anxiety (in contrast with the traditional method of terminating a scene at the first indication of subjective distress, Wolpe, 1958). Self-instructional training (Meichenbaum, 1973) and stimulus labeling strategies have been incorporated in later refinements of this coping-skills package.

Another approach to coping-skills training has been developed by Suinn and Richardson (Richardson & Suinn, 1973; Suinn, 1972; Suinn & Richardson, 1971) and labeled "anxiety management training." Anxiety management training, as in the Goldfried approach, emphasizes relaxation as an active coping skill. This approach is theoretically and procedurally linked to systematic desensitization and training involves arousing anxiety in the subject through the use of imaginal scenes. The anxiety management training may be viewed as a self-control procedure that is relatively nonsituation specific and involves the subject in the exercise of coping skills during laboratory stress conditions.

Yet another coping-skills package is described by Meichenbaum and Cameron (Meichenbaum, 1975) and labeled "stress inoculation." Briefly, it involves: (1) a discussion of stress reactions (with emphasis on labeling, attribution, and arousal-inducing self-statements and images); (2) relaxation training (presented as an active skill); (3) guided practice in the use of coping self-statements and various points during exposure to anxiety-provoking or stress situations; and (4) practice in the utilization of the coping skills in a novel, laboratory stress situation. Because it has been seen as a useful package in the treatment of pain, the stress inoculation package calls for a more detailed review (Meichenbaum, 1975; Meichenbaum & Turk, 1976).

Meichenbaum and his colleagues (Meichenbaum, Turk, & Burstein, 1975) reviewed the stress literature and concluded that a successful program aimed at training adaptive coping skills should: (1) be flexible enough to incorporate a variety of strategies that can be differentially employed in potential stress situations; (2) encourage cognitive plans that would reduce anxiety and lead to more adaptive coping responses; (3) encourage utilization of available information that stimulates mental rehearsal (i.e., the "work of worrying." Janis, 1958); (4) be sensitive to individual and situational differences; and (5) provide trial exposure to less threatening stress events during which coping skills can be consolidated and "tried on", i.e., inoculation.

A similar approach has been advocated by Orne (1965):

> One way of enabling an individual to become resistant to stress, is to allow him to have appropriate

> prior experience with the stimulus involved. The biological notion of immunization provide such a model. If an individual is given the opportunity to deal with a stimulus that is mildly stressful and he is able to do so successfully (mastering it in a psychological sense) he will tend to be able to tolerate a similar stimulus of somewhat greater intensity in the future.... It would seem that one can markedly affect an individual's performance in the situation...and his feelings that he can control his own behavior (pp. 315-316).

In light of these concerns, Meichenbaum and Cameron (Meichenbaum, 1975) developed the stress inoculation procedure outlined above. Specifically, the procedure consists of three phases: (1) an educational phase; (2) a rehearsal phase; and (3) application training.

The first phase of the stress inoculation training was designed to provide the subject with an explanatory schema for understanding the nature of his response to stress events. The most important aspect of this phase is that the conceptual framework be plausible to the subject and its acceptance should lead naturally to the practice of specific, cognitive, and behavioral coping techniques.

These techniques are taught in the second phase of the training--the rehearsal phase. The coping techniques are intended to be employed at various phases of the coping process. The coping techniques employed by Meichenbaum and Cameron (Meichenbaum, 1975) were both direct action and cognitive coping modes (cf. Lazarus, Averill, & Opton, 1974). Meichenbaum and Cameron emphasize that treatment generalization is built into the training package by encouraging the subjects to use their maladaptive behaviors, thoughts,

and feelings as signals (i.e., discriminative stimuli) to engage in the coping techniques that had been taught.

Once the skills had been acquired, the subjects were given the opportunity to try out the newly learned techniques in a stressful situation in the laboratory (application training).

Novaco (1977) successfully adapted the stress inoculation paradigm for use with individuals with problems of chronic anger. The coping skills consisted of: (1) differential awareness of personal anger problems (subjects became observers of their own behavior); (2) attunement to anger arousal and its cognitive components (monitoring their internal monologues); (3) the ability to alternatively construe provocation and to control arousal by means of relaxation; (4) covert self-regulation to guide structuring events and nonantagonistic encounter; and (5) the ability to remain task-oriented rather than ego-oriented when provoked. Novaco (1976) has continued to adapt the stress inoculation procedure, conducting a study in which he employed the stress inocculation paradigm in the preventative treatment of small groups of law-enforcement officers.

In summary, the stress inoculation training employed by Meichenbaum and Cameron (Meichenbaum, 1975) and Novaco (1976, 1977) involved the discussion of the nature of the stress reaction, provocation reaction and emotions, rehearsing cognitive and behavioral coping skills, and testing these skills under a "novel" stress or provocation condition. This leads to the final area of review--strategies of coping with pain and specifically the use of the cognitive-behavior technique of stress inoculation in the treatment of pain.

Enhancement of Pain Tolerance

A number of investigators (Chaves & Barber, 1974; Horan & Dellinger, 1973; Kanfer & Goldfoot, 1966; Kanfer & Seidner, 1972; Knox, 1972) have attempted to provide subjects with behavioral and/or cognitive coping strategies designed to enhance tolerance of pain. Though such pain treatments have become a topic of research interest in recent years, the history of cognitive treatments of pain is not new. As long ago as the stoic philosophers, it was believed that man could overcome pain by force of reason, the "rational repudiation" of pain. This same concept was espoused by Descartes and Spinoza in their recommendation that pain should be overcome through "premeation" of reason (Turk, 1978). Of the cognitive techniques that have been employed in the management of pain, perhaps the oldest is that of distraction or attention-diversion as exemplified by Kant's (cited in Fulop-Miller, 1938) utilization of this technique:

> For years, I have been troubled by morbid inclination and very painful stimuli which from others' descriptions of such symptoms I believe to be gout, so that I had to call a doctor. One night, however, impatient at being kept awake by pain, I availed myself to the stoical means of concentration upon some different object of thought such for instance as the name of "Cicero", with its multifarious associations, in this way I found it possible to divert my attention, so that pain was soon dulled. ...whenever the attacks recur and disturb my sleep, I find this remedy most useful (p. 28).

In more recent years, a number of other cognitive and behavioral methods have been employed to enhance pain tolerance, including: (1) "somatization" (e.g., Bobey & Davidson, 1970; Evans & Paul, 1970)--focusing on the existence, production, or inhibition of bodily processes or sensations, including the experimentally induced

pain e.g., comparing pain sensations to an arm that has fallen asleep; (2) "imaginative transformation of pain" (e.g., Blitz & Dinnerstein, 1968, 1971; Knox, 1972)--acknowledgement of the experimentally induced sensation, but transforming or interpreting these sensations as something other than pain, or minimizing the sensation as trivial or unreal, e.g., imagining the limb as numb, injected with Novacain; (3) "imaginative transformation of the context (e.g., Blitz & Dinnerstein, 1968; Knox, 1972)--acknowledgement of the experimentally induced pain, but transformation of the context in which the pain occurs, e.g., imagining oneself as a spy, shot in the arm; and (4) relaxation and deep breathing (e.g., Bobey & Davidson, 1970; Mulcahy & Janz, 1973; Neufeld & Davidson, 1971). The design typically employed in these studies is one in which only one of the strategies cited above is used in the experimental group while a second group employs a different strategy or functions as a control.

Several authors (e.g., Melzack & Casey, 1970; Meichenbaum, 1975; Turk, 1978) have suggested that although a wide variety of general procedures are capable of reducing pain, a more effective means of modifying an individual's perception of a stressful situation would be to "tailor" a procedure to meet the needs of the specific individual in a specific situation. That is, one could use a multifactor approach that enables the subject to employ those features of the "treatment package" that are most salient for him in the given situation.

The most extensively examined cognitive behavioral, skills-training approach for management of lab ratory-produced pain is

stress inoculation (Hackett, 1978; Hackett & Horan, 1980; Horan, Hackett, Buchanan, Stone, & Demchik-Stone, 1977, Meichenbaum & Turk, 1976; Turk, 1975, 1977). This treatment regimen has consistently demonstrated attenuation of pain even though stress inoculation was originally designed to modify the behavior of neurotic clients. The stress inoculation procedure explicity teaches the subject to cognitively cope, by such diverse means as using distractions, self-instructions, relaxation, altering attributions, and self-labels, imagery rehearsal, and shifting attention.

The first attempt to employ the stress inoculation procedure to enhance tolerance for pain was conducted by Turk (1975). In that study, aversive stimulation was produced by the submaxium effort tourniquet technique (Smith, Egbert, Marhowitz, Mosteller, & Beecher, 1966). This procedure involves the inflation of a blood-pressure cuff at a high level (240 mm Hg) followed by a moderate amount of exercise by that arm (squeezing a hard dynamometer). The intense pressure produced by the inflation of the cuff serves to block the brachial artery and consequently the flow of blood to the lower arm and hand. The exercise serves to deplete the available oxygen producing muscle ischemia and subsequently a steadily intensifying, aching pain.

The format of the skills training developed by Turk (1975, 1977) and Turk and Meichenbaum (1976) was analagous to that of the stress inoculation paradigm of Meichenbaum and Cameron (Meichenbaum, 1975) described above (see also the Method section of the journal article). In a more recent study, Turk (1977) extended and replicated the earlier results substantiating the relative efficacy of the stress

inoculation training. In this latter he expanded his earlier training procedures into a pain treatment manual (Appendix C contains an outline of the expanded stress inoculation training). In this study, the relative efficacy of stress inoculation was further substantiated and generalization to a novel, cold pressor stress was demonstrated.

Horan et al. (1977), as well as Hackett (1978), have provided additional replication of the efficacy of the stress inoculation paradigm. They extended the Turk results by employing both male and female subjects as well as male and female trainers. The study was designed to study the effects of the various components of the stress inoculation package. The results of the Horan et al. study indicate that neither the initial conceptualization, nor repeated exposures to a stressor were sufficient to increase tolerance for pain, while the combined stress inoculation significantly enhanced tolerance and also reduced the amount of discomfort reported by subjects.

Jaremko (1979) reviewed the various studies using stress inoculation in general and made numerous suggestions--some that are relevant to the enhancement of pain tolerance. He suggests that the stress inoculation treatment and its components should become standardized in future research. Turk (1980) has published a pain manual that attempts to accomplish this task. Turk's training manual uses a modified presentation of Melzack's (1973) gate control theory in the education phase of stress inoculation (cf. Beecher, 1959). This simplication of the rational for cognitive control of pain is intended to help the subject better conceptualize how the treatment works. Hackett and Horan (1980) have attempted to use Melzack's gate

control theory in their research and have found portions of this complex explanation largely misunderstood and therefore ignored by subjects. The simpler explanation employed by Turk (1980) appears to mitigate this problem by lessening the complexity of the rationale.

Jaremko (1979) also suggests that for clarity, the rehearsal phase should be renamed "skills training" since the label rehearsal seems to overlap with the name of the third phase, application. One other suggestion made by Jaremko (1979) is for further research to test role-playing (for clarity, renamed role-rehearal in this research) in the application phase which serves to enhance the subjects tolerance for pain, a position taken by Turk (1977), but not experimentally tested.

One other major issue, found in any laboratory analogue study, concerns the external validity of the procedure; that is, the degree to which results generalize to other populations, behaviors, and settings. The laboratory procedures employed in the stress, inoculation studies reviewed above (Hackett, 1978; Horan et al., 1977; Hackett & Horan, 1980; Turk, 1975, 1977) attempted to simulate clinical pain as well as can be achieved in the laboratory. Beecher and his colleagues (Beecher, 1966; Smith et al., 1966) demonstrated that the submaximum effort tourniquet technique employed by the Turk studies (1975, 1977) produces a dull, aching, slowly mounting pain that most closely approximates pathological pain. Sternbach (1974) reports that this technique mimics the duration and severity of somatogenic pain producing the marked autonomic changes that frequently accompany pain of pathological origin, and Clark and Hunt

(1971) have suggested that the ischemic and cold pressor stress [utilized in the Horan et al., (1977) and Turk (1977) studies] are the best laboratory analogues to the pain encountered in clinical settings. Hackett (978), after reviewing the problems of the cold pressor, suggests that the use of the submaximum tourniquet (Smith et al., 1966) would be more preferable in pain research because of its greater generalizability to clinical settings. However, the questions of external validity can only be answered by further research in actual clinical-pain populations.

The phenomena of pain is still very puzzling (Hilgard, 1969). Anxiety and other emotional states clearly have an effect on tolerance for pain. Various theories have been proposed to explain how pain is experienced, however, the theories do not seem to be totally correct. Many different techniques that would roughly fit into the category of cognitive-behavioral techniques have been used in the treatment of pain. Of these various techniques, those that are multidimensional in scope have been shown to have the most promise in enhancing pain tolerance. Stress inoculation, one such multidimensional treatment package, has been shown to be efficacious in a variety of studies and should be researched further in an attempt to expand the parameters of its treatment uses.

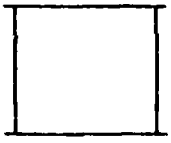
APPENDIX B

NAME_____

SUBJECTIVE DISCOMFORT SCALE

On this scale, you are asked to report the amount of discomfort you experienced just prior to the moment you had the blood pressure cuff removed from your arm.

In the block below, please indicate a number between 0 (representing no discomfort) and 100 (representing unbearable discomfort) which best approximates the amount of discomfort you experienced.



APPENDIX C

Summary of Turk's Skills
Training Manual (1980)

I. Conceptualization of the "pain experience" with two components: The sensory input and the reactions of the individual to that sensory input.

II. Relaxation can be employed to reduce the sensory input. Focus on:

A. Tensing and relaxing the various muscles that receive the intense stimulation.
B. Slow, deep breathing, with 3-5 seconds holding, and 5 seconds exhaling.
C. Thinking of pleasant or relaxing words or pictures while exhaling, for example, the word "calm," or a picture of a feather gently floating.

III. Attention-diverting coping strategies. Note:

A. One cannot focus on more than one thing fully at any one time.
B. A person can select what she will focus her attention upon and what to exclude from her attention.
C. A variety of different coping strategies are available for a person to employ at various times in a stressful situation. One can switch from one strategy to another as often as he wishes.
D. Types of coping strategies:
   1. Focusing attention on physical characteristics of the environment.
   2. Focusing attention on various thoughts.
   3. Focusing attention on the part of the body receiving intense stimulation.
   4. Imaginative inattention. Ignoring the intense stimulation by engaging in a mental image, which if real, would be incompatible with the experience of pain.
   5. Imaginative transformation of pain. Interpreting the sensations you are receiving as something other than pain, or minimizing those sensations as trivial or unreal.
   6. Imaginative transformation of context. Picturing an image or mental scene in which the intense stimulation received is different from the actual situation.
E. Coping strategies that employ visual images are like mental pictures that can be related to a wide variety of situations. The greater the degree of involvement, absorbtion, and vividness of the image, the more effective such strategies are in coping with a stressor.

IV. Self-instructional training. Self-instructional training involves breaking a stressful situation down into three phases with self-reflection throughout the situation. The phases are:

A. Preparing for the intense stimulation before it becomes too strong. Self-instructions and statements that can be made at this phase include:
   1. What is it I have to do (viewing the situation as a problem that you can do something about)?
   2. I can develop a plan to deal with it (preparing oneself by making a plan or mental outline of how you will deal with the sensations when they arise).
   3. Just think about what I have to do (focusing on what the situation requires).
   4. Think of the things that I can use to help cope (review all the strategies that you know and that may be helpful).
   5. Don't worry; worrying won't help anything (use any anxiety or worry as a cue to remind you to focus on what you have to do).
   6. Remember, I can shift my attention to anything I want to (reassure yourself about your ability to employ various coping strategies).
   7. When I use mental imagery, I'll see how vivid I can make the scene (review various aspects of the different images and strategies that can be used).

B. Confronting and handling the intense stimulation (self-instructions and statements that can be made at this phase include):
   1. I can meet this challenge (view the situation as a challenge that you deal with).
   2. One step at a time, I can handle the situation (don't do everything at once and don't be overwhelmed; rather, use each of the skills you have learned).
   3. Just relax, breathe deeply, and use one of the strategies (review and use any of the strategies that you have outlined in your plan for coping).
   4. I won't think about any pain, just about what I have to do (focus your attention on the task at hand and what you can do right now to help you cope).
   5. I'm feeling tense; that can be an ally, a cue to switch strategies and to take some slow deep breaths (expect to feel tense at times; that's not unusual, but use your tenseness as a cue to relax and to review which strategy to employ next).
   6. Remember, I can switch back to some strategies that I used before, but switched from (there is no reason why you can't return to some strategies already used).

C. Coping with thoughts and feelings that arise at critical moments (when you notice that the intensity of the sensations seem to be increasing or you think you can't go on any more). Self-instructions or statements that can be made at this phase include:
   1. When I feel any pain, just pause; keep focusing on what I have to do (keep in mind the task at hand and what you have to do).
   2. Don't try to eliminate the pain totally, just keep it manageable (remember, you expected to detect some intense stimulation, but don't overreact and make things worse).
   3. I knew the sensations would rise; just keep them under control (don't magnify the intensity of the sensations you experience).
   4. Remember, there are a lot of things I can do; I can keep things under control (you have been taught a number of different strategies that will help you keep the intense stimulation under control).
   5. Things are going pretty bad; I can't take any more--just pause; don't make things worse. I'll review my plan of strategies to see what I can switch to (sometimes you may have unpleasant thoughts or feelings; use those as cues to review the strategies available for you to use).
   6. My arm looks terrible; things are falling apart; I better stop--relax. I can focus my attention on something else; keep things under control (if you find yourself focusing on unpleasant sensations or thoughts, remember you can choose what you will focus your attention upon).

D. Self-reflection and positive self-statements.
Self-reflective statements that might be used throughout a stressful situation:
   1. That's it. I've outlined what I have to do, what strategies I can use and which ones I will switch to.
   2. I'm doing pretty well; it's not as hard as I thought.
   3. I'm doing better at this all the time.
   4. I won't let negative thoughts interfere with using my plan.
   5. Wait until I tell the trainer which things worked best.
   6. I knew I could handle it; I'm doing pretty well.

APPENDIX D

INFORMED CONSENT DOCUMENT

Brigham Young University

Title: An Analysis of Enhancement of Tolerance for Pain

Investigators: David L. Schmidt, Doctoral Candidate
Michael J. Lambert, Ph.D., Department of Psychology

This is to certify that I, _____, hereby agree to voluntarily participate in a scientific investigation as an authorized part of the educational and research program of Brigham Young University under the supervision of David L. Schmidt (Department of Psychology).

The investigation and my part in the investigation have been explained to me by Mr. Schmidt, and I understand them. The procedure and its discomforts are described on the back of this form, and have been explained to me. Any question I may have regarding these procedures has been answered to my satisfaction. I understand that any data or answers to questions will remain confidential with regard to my identity.

I further understand that I am free to withdraw my consent and terminate my participation at any time.

_____ _____

Date Subject's Signature

INFORMED CONSENT DOCUMENT

(continued)

Purpose of the Study

This investigation is being conducted to assist people in coping with pain and discomfort without the use of drugs. We are interested in investigating people's tolerance for pain caused by inflation of a blood pressure cuff.

Procedure

You will be asked, as a subject, to place a blood pressure cuff on your arm on three separate occasions and answer several questions regarding this experience. You may (though not necessarily) also be asked to participate in a 45- to 60-minute training session immediately before you experience the "cuff" on the second occasion. Although you will be asked to leave the cuff on your arm as long as possible, you may have it removed at any time. This task, while uncomfortable, is harmless and has been used in this kind of research for many years.

Your total time commitment for this investigation should not exceed two hours, and will probably be considerably less. You may, of course, terminate your participation in the investigation at any time.

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ENHANCEMENT OF TOLERANCE FOR PAIN:

GROUP VERSUS INDIVIDUAL STRESS

INOCULATION TRAINING

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ABSTRACT

This study evaluated three specific areas of stress inoculation training in the enhancement of tolerance for pain: (1) maintenance of treatment effects at two-week follow-up testing; (2) group versus individual administration of the treatment package; and (3) the use of role rehearsal in aiding consolidation of information in the application phase of the treatment. The results show a significant increase in pain tolerance on posttest measurement. There were no decay effects on two of the outcome measures on follow-up and an actual improvement on the most important measure, total pain tolerance time. Neither group nor individual administration of the treatment package was shown to be more effective in enhancing tolerrance for pain. However, some practical reasons for preferring group administration were discovered. The use of role rehearsal in which the subject assumed the role of the instructor in teaching the technique to a "novice subject" was not found to have a significant effect on outcome measures. The results suggest some interesting extensions of the efficacy of the stress inoculation training.

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